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# Study of Self-reported Emotions and Facial expressions on consumer acceptability of the energy drinks

A Dissertation

submitted in partial fulfilment

of the requirements for the Degree of

Master of Science in Food Innovation

at

Lincoln University

by

Annu Mehta

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Abstract of a Dissertation submitted in partial fulfilment of the requirements for the Degree of Master of Science in Food Innovation.

# Study of Self-reported Emotions and Facial expressions on consumer acceptability of the energy drinks

by

Annu Mehta

Emotional responses elicited by food products are of great interest for marketing professionals and new product developers, as consumer acceptance of the product has been proved to be linked to the emotional response provoked by the product in the consumers. An emotional measurement is a reliable tool which helps in differentiating between the products of the same nutritive value, taste and price. The emotional response elicited by the food product's taste, recognition of the brand, and the packaging. There are many methods to measure emotions: physiological methods, self-reporting verbal emotion, self-reporting visual emotion measurement, and facial studies. Two studies: 1) tasting session of energy drinks (Rockstar energy drink and V Guarana energy drink) and 2) visual observations of the original and redesigned labels of the energy drinks were conducted. During the tasting session, consumers assessed the liking (9-point hedonic scale), and emotions (EsSense Profile® - CATA questionnaire). Facial expressions of panellists were assessed using Affectiva Affdex software in order to ascertain the unconscious emotional responses elicited by the products. For labels, only liking and self-reported emotions were assessed by the panellists. The familiarity and purchase intent were also assessed in both sessions. The result shows a significant difference in liking between the two brands of energy drink during the tasting session. Rockstar energy drink was liked more than V Guarana energy drink during the tasting session. Facial reactions study indicated a higher level of involvement from the consumer with the preferred product. In the case of labels, panellists liked and were more familiar with original labels than with the redesigned labels of the energy drinks. In conclusion, the study showed the impact of familiarity, liking and emotions on the acceptability and purchase behaviour of the consumers towards energy drinks. The results will also

help in better understanding of the effect of unconscious responses on the acceptability of the product.

**Keywords**: Emotions, EsSense Profile®, Facial expression, Purchase intention, Energy drinks

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**Table of Contents**

**List of Tables**

**List of Figures**

# Chapter 1

# Introduction

Globalisation and the increase in competition have forced food industries to keep the innovation of products. However, the success of these newly developed products in the marketplace is not guaranteed. According to recent studies, 50-70% of newly launched food products do not last long in the market despite the intensive market research, sensory evaluation and consumer's preference testing that precedes their launch (Dijksterhuis, 2016). In sensory science, liking scores have been the main criteria to judge the market success of the product (De, Graaf et al., 2005). The higher the liking scores, the more acceptable will be the product in the market. In the food industry, the 9-point hedonic scale is most widely used scale for acceptability (Peryam & Pilgrim, 1957a). It was developed by the US army for planning the menu for soldiers in the canteen. The 9-point hedonic scale consists of 9 verbal categories ranging from "disliked extremely" to "liked extremely" (Amerine, Pangborn, & Roessier, 1965). In the "number only" scale, the verbal categories are changed to numbers from 1 (disliked extremely) to 9 (liked extremely). The primary purpose of the 9-point hedonic scale is to compare the liking of the different food products, as liking scores were the main criteria to launch a product in the market. The 9-point hedonic scale can evaluate only one attribute at a time, thus making it a long and tedious process. Sensory liking tests helps to eliminate the least liked product, but they provide limited insights into food-choice behaviour (Zandstra & El-Deredy, 2011; Griffiorn-Roose et al., 2013). Moreover, in the present scenario, where the market is full of a wide range of products, the liking ratings are not sufficient to launch a product in the market. However, the study of food evoked emotions provides insights into further dimensions of the product which were missed by acceptance and traditional sensory acceptability tests (Thomson, Crocker, & Marketo, 2010). Therefore, food elicited emotions are becoming an essential tool for product differentiation. Emotions strongly influence the consumer's preferences, liking, and purchase behaviour depending on the context (Koster, 2003; and Kang, Jin, & Gavin, 2010). Emotional research also provides information about individual food choices (Gutjar et al., 2015a; Dalenberg et al., 2014), which can help in innovating a successful new product in the market.

## 1.1 Emotions and Food

Food and emotions are related to each other. Emotions decide our food choices and other times, food consumed evokes certain emotions. Extensive research had been done on emotions affecting food choices or intake (Gibson, 2006a), while limited work was done on food evoked emotions. Food

evoked emotions and emotions depend on several factors, including hunger, satiation, age, health, memory, economic conditions and expectations from past memories. Emotions evoked by remembering the product strongly influence the purchase decision by the consumers. The intensity or valence of emotion also affects food intake. The consumption of food intake increases when people are sad or stressed (Macht, 2008), as it acts as a coping mechanism. Food evoked emotions are generally related to positive emotions ("happy", "joyful", and "delight") than negative emotions ("disgust" and "bored") (Desmet & Schifferstein, 2008a). Positive emotions evoked when a person is in a happy mood or eat the food which he likes (Lyman, 1982), such as children/adults feel "happy" and "good" emotion after having their favourite ice cream or chocolates.

## 1.2 Emotions and Packaging

Along with intrinsic factors of the food product, the extrinsic factors such as packaging and labels also have a substantial impact on the emotions and purchase decisions of the consumers (Silayoi & Speece, 2007; Deng & Srinivasan, 2013), which can also encourages impulsive buying in the consumers (Hubert et al., 2013). According to Keller (2013), about 20,000 products lie on supermarket shelves to compete with each other and to get picked up by the consumer. Attractive packaging makes the product distinct from the competitors on the shelves of supermarkets and more desirable to consumers. Packaging has evolved from being a utilitarian dimension of the product to a powerful marketing tool. Marketing has transformed the function of packaging from a protective layer to a distinctive medium that imparts visual presence, attractiveness, shelf visibility and information to the consumer at the point of sale. Good packaging also is in line with the personality of the brand that the marketing company wishes to communicate to the consumer and can add additional layers to the narrative developed by a brand. For example, a brand that wishes to communicate its engagement with ecological causes can utilize packaging that reflects its ideals by combining an eco-friendly substance with suitable design elements and information to enhance its attractiveness to its target consumer. In categories like beverages where the product is often consumed through an engagement with the can, that acts as the packaging for the product; several cues are often given to the consumer of the nature of the product and the brand. Hence the packaging elicits emotional responses that differ from one brand to the other, and each brand aims to provoke an emotional response that is at once coherent with those that the category it belongs to is supposed to evoke but also different from that of its competitor and in line with the differentiated message that it seeks to convey. The holistic design of packaging consists of a label, illustrations, brand elements, graphics, product information, messages and the logos (Orth & Malkewitz, 2008), which collectively acts as a "salesman" between consumers and brand owners. Colours are the

fundamental elements of packaging which provide information about the product and catch the consumer's attention (Klimchuk & Krasovec,2012). The colour affects the consumer's perception of the product strongly. For example, green is generally linked with nature and leafy vegetables, and red is associated with sweetness and arousal (Garber, Burke & Jones, 2000). Thus, the change in colour of the packaging strongly affects the perception of the consumers and liking of the products, as studied earlier by Piqueras-Fiszman, Velasco & Spence (2012); Spence & Piqueras-Fiszman (2016).

## 1.3 Importance of measuring emotional responses

Emotions play a significant role in the understanding of food preferences and consumers' likings (Cardello et al., 2012a). Consumers can elicit two types of emotional responses, conscious and unconscious when exposed to different products. Rey, Goldstein & Perruchet (2009) concluded that a decision made by the subconscious approach or by little thinking is better in understanding the attitude toward the product than a decision made by a conscious approach. However, most market research is based on conscious arousal and measured with self-reporting scales (Bettiga, Lamberti, & Noci, 2017). According to Creswell, Bursley and Satpute (2013), the unconscious mental processes have been shown to facilitate goal-directed behaviour (Bargh et al., 2001)., strengthening of memory (Tamminen et al., 2010), discernment and creativity (Wagner et al., 2004) and taking better decisions (Dijksterhius & Nordgren, 2006). The autonomous nervous system (ANS) is related to immediate and autonomous responses towards stimuli. The autonomous nervous system (ANS) is a division of the peripheral nervous system which controls the functioning of various organs including heart rate, respiratory patterns, body temperature, and other unconscious reactions (Janig, 1989). These parameters can reflect emotions and can relate to consumer preferences for different products. Heart rate, skin temperature and conductance can be measured by the use of electrodes and sensors, which may cause stress in the participants, resulting in conscious and unconscious biases during the tasting sessions (Gonzalez et al., 2018a). Hence, non-invasive video analysis methods are used effectively to analyze these parameters. Photoplethysmography is a new and non-invasive technique to monitor heart rate, respiratory rate and tissue blood perfusion.

Emotional responses are affected by various factors like gender differences. Desmet (2008) stated that emotions are very subjective and can vary with individuals like female panellists report more positive emotions like happy, joyful, and satisfied as compared to male panellists (Brody & Hall, 2008). Emotional responses also vary with the time of the day sensory is performed (King, Meiselman & Carr, 2013a), like people do not prefer eating snacks at the mealtimes and the context in which study will be done (Gibson, 2006b). According to Porcherot et al., 2015, the emotions

evoked after food intake in ecological situation are different from emotions evoked after consumption of food in controlled conditions of laboratory setting.

## 1.4 Methods to measure emotional responses

### 1.4.1 Self-reported emotions

Emotions are divided into positive and negative or pleasure and displeasure (King and Meiselman, 2010a). Food-related emotions are mostly positive and rarely negative. In Psychology, there are different approaches to check emotions. Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988) is a widely used self-reported emotional questionnaire used by Psychologists. It measures positive and negative emotion based on situational manipulation. PANAS can be used only during the activated emotional states. The other well-established clinical psychology questionnaire, the Profile of Mood States (POMS) (McNair, Lorr, & Droppleman, 1981), which measures the combination of emotions such as anger-hostility and affective states such as fatigue-inertia. The subscales of Multiple Affect Adjective Checklist (MACCL) assess anxiety, depression and hostility (Jones, Bastian, & Jones, 2016). These questionnaires are extensively used for clinical Psychology and Psychiatry and cannot be used to evaluate food products because they emphasize more on negative emotions, while in commercial products, positive emotions are more predominant (Schifferstein & Desmet, 2010). Moreover, many descriptors (lexicon) used in the clinical psychology questionnaire are not relevant to the emotions related to consumer testing (King and Meiselman, 2010b). Many types of researches have been conducted to develop a standard questionnaire for consumer preferences which helps in product development (Richins, 1997). Geneva Emotions and Odor Scale (GEOS) consists of 36 adjective emotional terms grouped in six categories that were developed to study emotions related to odour (Porcherot et al., 2010a). ScentMove™ was an improved version of GEOS and consisted of only six items (Porcherot et al., 2010b). Emotions can be assessed by self-reporting methods such as PrEmo® and EsSense Profile® (King, Meiselman, & Carr, 2010b). Product Emotion Measurement Instrument (PrEmo®) (Gutjar et al., 2015b) is a cross-culturally accepted method to measure emotions. It consists of 12 emotions, which are expressed in the form of animation of the cartoon character instead of verbalization of emotions. However, the small number (12) emotions are not sufficient for consumers to express their food evoked emotions. The EsSense Profile® was published by King, Meiselman, & Carr (2010c) and measures both overall acceptability as well as emotions related to the food product in the consumer test questionnaire. EsSense Profile® consists of a CATA questionnaire with 39 different emotions and moods for panellists to evaluate food products and food names (developed by King &

Meiselman,2010c). Recent studies using the EsSense Profile® questionnaire have validated its discriminating power for different products as well as the same product category (Cardello et al., 2012(b); Ng, Chaya, & Hort, 2013). EsSense Profile® questionnaire is cost-effective and easy to use for panellists and covers a wide range of emotions and is easy to interpret by researchers. Sometimes long questionnaire can be difficult to use in time constrained and untrained panelists. Thus, a shorter version of EsSense Profile® can be used with a smaller number of emotions (Nestrud et al., 2016a). Based on the principle component analysis, emotions and acceptance are grouped based on the level of correlation between them. It illustrates which emotion is associated with acceptance and which is not. Previous studies had demonstrated that measurement of emotional responses in beer (Chaya et al., 2015), coffee (Kanjanakom & Lee, 2017), and wine (Ferrarini et al., 2010) provides rich insight into the consumer's perception as well as liking of the product. Samant and Seo (2019), studied that sensory intensities along with emotions measured by self-reporting questionnaire and unconscious responses by facial expression helps in better understanding of overall liking of the product by the consumers, while, autonomous nervous had limited contribution in the results. Emotional analysis is also useful in understanding the effect of labels and packaging on the acceptance and purchase behavior of the consumers.

### 1.4.2 Unconscious responses of emotions

Facial expressions of emotions are one of the important novel methods to study emotional responses, as they help to understand human behaviour and real emotions in humans. Facial expression is a non-verbal language that communicates emotions in humans and the importance of facial expressions was first evaluated by Darwin (1872) and stated that facial expressions in human and animals are related to emotions. Facial expressions can be partially controlled, but they still provide insight into the human mind. Humans provide distinctive facial expressions for five basic tastes: protrusion of tongue, relaxed face and sucking for sweet taste; lip pursing for sour taste; mouth gaping, wrinkling of nose and mouth corners lowered for bitter taste; and minimum facial movement for salty taste (Steiner et al., 2001a; and Zeinstra et al., 2009). Mehrahian (1968) stated that information to consumers (marketing, packaging and sensory) is expressed by 7% verbal, 38% vocal and 55% by facial expressions (FE) and behaviour, which are not conscious responses. Ekman & Friesen (1971), recognized six primary emotions (happy, sad, disgust, surprised, fear, and anger) on the basis of unique facial expressions. These models of the emotional display are also called basic emotions, and these emotions are universally accepted by different ethnical and cultural groups. However, it gained inertia in the nineteenth century after the pioneering work of Mase and Pentland in 1991, and now it is widely used in various fields of medicine, robotics, and virtual reality. According to Ekman et al (1987), cross-cultural emotions are expressed with the same facial

expressions, which is by the combination of different muscle movements that are governed by the neural network.

Facial reactions can be analyzed with Automatic Facial Expression Recognition (AFER) system (Danner et al., 2014a), Electromyography (EMG) (Hu et al., 1999) recordings, Izard's MAX, or Facial Action Coding System (FACS) (Ekman & Friesen, 1978). In Autonomic Facial Expression Analysis (AFER) is a complicated approach to measure facial expressions, as facial features vary from one individual to another because of age, gender, culture, facial hair, and glasses. It is also very sensitive to the lighting of the room and the pose of the panellists (Fasel & Luettin, 2003). In facial electromyography (EMG), electrodes fixed on the panellist's face measure electric potential to infer muscular contraction. EMG is an ideal system as it can detect facial movement, which can be otherwise missed by the naked eye. However, it has some drawbacks, as it can be an obtrusive method that interferes with the panellist's behaviour. Also, the movement of adjacent muscles can lead to misinterpreting emotions. Izard's (1977a) maximally discriminative facial movement coding system (MAX) is based on theoretically derived techniques, in which facial movements are categorized based on which area of the face should be involved for specific emotions. Izard's MAX (1977b) failed to capture relevant facial movements, which is not the case with FACS. Facial Action Coding System (FACS) is one of the first coding systems used to measure human facial movements as it appears on the face. Facial Action Coding System is an efficient, objective and most widely used facial expression measuring approach among Psychology researchers. According to FACS, the face is divided into the upper face sections and lower face sections. The upper face sections include eyes and eyebrows and lower face sections include nose and mouth. In Emotional Facial Action Coding System (EMFACS) (Friesen & Ekman, 1983), Action Units (AU) (movement of the minimum number of facial muscles) are 44 different reactions used to describe six facial expressions of emotion such as anger, fear, happy, disgust, surprise, and sad. Facial Action Coding System (FACS) is a time-consuming method, so new novel techniques like Affdex from Affectiva are used widely for the recognition of basic human emotions because it is fast and easy to use. Affdex is a software which measures six basic emotions (happy, sad, disgust, fear, angry, and surprise) based on physiological changes or the facial movements (Magdin & Prikler, 2017a). It is a simple, fast and accurate face recognition software used worldwide and used in this study as well.

The focus of the study is to find the emotions evoked after tasting of energy drinks through EsSense Profile® and Facial expressions. Moreover, to evaluate the emotional responses and familiarity after changing the colour of the packaging of the samples. Torrico et al., (2018) had worked on emotions through facial expression, which helps in better understanding of consumer's acceptability of the

product based on familiarity and unconscious responses. The study of emotions with a self-reported questionnaire is done extensively but to find an emotional response based on facial expression is still a new exploring field. Energy drinks were used because they are the most popular functional beverage among adolescents and young adults. About 35% of energy drinks are consumed by college students or youth within the age limits of 18-30 years (Larson et al., 2015; and Heckman, Sherley & De Mejia, 2010), for performance-enhancing, a stimulant drug, and psychoactive effects. There is a vast range of energy drinks in the market with caffeine content ranging from 50 mg to 505mg per can or bottle. The global sales of energy drinks were estimated at USD 50 billion in 2015 (Fontinella, 2015). It is one of the fastest-growing segments in the beverage industry.

## 1.5 Objectives

The present study aimed to evaluate the effects of taste and labels on the acceptability and emotional responses of consumers toward energy drinks. The study emphasizes the effects of familiarity, liking, and food evoked emotions on the purchase intent of the product. It will also aim to understand better the acceptability of the product based on the emotions and unconscious responses. There is limited information regarding the influence of packaging on consumer emotions. Thus, the present study helps in exploring how the consumer's emotional responses are affected by the sensory cues and packaging of the energy drink products using self-reported method and familiarity.

# Chapter 2

# Material and Methods

Forty-seven panellists (M/F: 21/26) were recruited via email for the research experiment. The research protocol and selection of panellists were approved by the Human Ethics Committee (2019-68) of Lincoln University, New Zealand. The panellists who participated in the experiment were students and faculty of Lincoln University, New Zealand and were within the age group of 20-45 years. The majority of the participants were Asians (China, India, Vietnam, Korea and Cambodia). The panellists with normal sensory abilities were selected for the study (ISO 8586-1,1993). Participants with food allergy and sensory deficiencies such as ageusia or anosmia were excluded from the research. The panellists were not trained for the experiment, and no prior information regarding the study was disclosed to them. The panellists were asked to fill the consent form before the commencement of the evaluation as per ethical requirements. Participants gave their consent for the session to be video recorded. The experiment was conducted in the Sensory Evaluation room at the RFH Building of Lincoln University, New Zealand. The laboratory meets the sensory evaluation requirements listed in ISO 6658, 2005 and GB 13868, 2009. The samples (~10ml) were stored and served at a refrigerated temperature of 4$^{o}$C in the transparent plastic cups marked with three-digit random codes in a white tray for tasting. Randomization of samples presentation was required for statistical validity. Crackers and water were served to rinse the palate after each sample and were asked to take a five-minute break before the next tasting to avoid sensory fatigue.

The study was divided into two sections; tasting session of the energy drinks, and visual evaluation of the original and redesigned labels of the Rockstar and V Guarana energy drinks. During the tasting session, panellists evaluated the energy drinks for the sensory attributes, overall liking, familiarity, purchase intent, and emotions. Facial expressions of panellists were assessed to find the unconscious emotional responses elicited by the panellists. For labels of the energy drinks, panellists assessed overall liking, familiarity, purchase intent and emotions.

During the tasting session, the facial expressions of the participants were recorded with the help action cameras of video resolution of 4K (UHD) at 30 FPS, (X450, Kaiser Baas, Australia). Before the commencement of the study, the participants were instructed to adjust the seat and not to move during the experiment. Panellists were asked to avoid covering their face and to minimize body movement during the study. Bright illumination of the sensory booth was required to enable precise and accurate recording of the facial expressions. The participants were asked to look directly at the

camera after tasting the sample. The liquid samples were used for the experiment because chewing and mastication of solid foods can disturb facial expressions. The panellists who had participated in the evaluation were gifted a can of energy drink as a token of appreciation.

## 2.1 Sample Selection:

The samples used for the research were energy drinks, which were commercially available in the supermarkets of New Zealand during the experiment. A focus group (N=4) of four trained panellists had evaluated five different brands of energy drinks (Red Bull, Red Bull GmbH, Austria), (Monster, Monster Beverage Corporation, USA), (Mother, Monster Beverage Corporation, Australia), (V Guarana, Frucor, New Zealand), and (Rockstar, Rockstar, Inc, USA) on hedonic scale for liking. After statistical analysis of the result and discussion in the focus group, two energy drinks with the highest and the lowest rating were selected. Rockstar energy drink manufactured by Rockstar, Inc, The United States and V energy drink produced at Frucor, New Zealand were selected for the experiment. The ingredients of both the energy drinks are listed in TABLE 2-1.

**Table 2-1: Ingredients List Of Energy Drinks(Source: www.v.co.nz and www.rockstarenergy.com)**

| NAME | INGREDIENTS |
|---|---|
| ROCKSTAR ENERGY DRINK | Carbonated water, Sucrose, Glucose, Citric acid, Taurine, natural and artificial flavours, Sodium citrate and Caffeine, Benzoic acid, Caramel colour, Sorbic acid, L-cartinine, Inositol, Niacinamide, Calcium pantothenate, Milk thistle extract, Gingko, Biloba leaf extract, Guarana seed extract, Panax. Ginseng root extract, Riboflavin, Pyridoxine hydrochloride, Cyanocobalamin. |
| V ENERGY DRINK | Carbonated water, sugar, acidity regulator (citric acid and sodium citrate), Taurine, Guarana extract (0.12%), colour (caramel), Glucuronolactone, Caffeine, Inositol, Vitamins (Niacin(B3), Pantothenic acid, B6, Riboflabin B2, (B12), Flavours and contains wheat derivatives |

### 2.1.1 Labels

The original labels of the energy drinks were taken from the official website of Rockstar (www.rockstar.com) and V guarana (www.v.co.nz) (FIGURE 2.1). The new labels are shown in FIGURE 2.2. The colour of the labels was changed using the graphic design software, Adobe illustrator (Adobe Inc., California, U.S.A) and retained a design language similar to the original label while altering the colours of the label as previous studies state that change in colour of labels and packaging produces emotional responses in consumers (Liao et al., 2015). Previous studies showed that despite no cognitive thinking, even a slight change in colour of packaging affects the sensory perception of the food product (Merlo et al., 2019a).



**Figure 2.1: The Original Of Rockstar And V Guarana Energy Drinks. (Source: http://rockstarenergy.com/ and https://www.v.co.nz/ ).**


**Figure 2.2: Redesigned labels of Rockstar and V Guarana energy drinks by Adobe Illustrator.**

## 2.2 Methods Used

During the tasting session, the energy drinks were evaluated for sensory attributes, liking and familiarity using the 9-point hedonic scale and emotions evoked during tasting by EsSense Profile® and Facial expressions. Labels of energy drinks were evaluated for liking and familiarity with the hedonic scale and packaging evoked emotions with EsSense Profile®. The panellists were asked to taste the samples and answer the questions related to liking and emotions felt during the tasting in the questionnaire present in RedJade® Sensory Software (RedJade®, Redwood Shores, CA, USA) using tablet computers. For Purchase intent of energy drinks and labels, the binomial scale was used by the panellist.

### 2.2.1 Hedonic Scale

The sensory attributes (Taste, Aroma/flavour, Sweetness, Bitterness, Mouthfeel, and After taste), and liking of the energy drinks were evaluated using the 9-point linear hedonic scale (Table 2-2) (Peryam and Pilgrim, 1957b):1 (disliked extremely) and 9 (liked extremely).

**Table 2-2: A 9-Point Hedonic Scale by Peryam And Pilgrim (1957c).**

| 9-POINT HEDONIC SCALE | |
|---|---|
| 9 | LIKED EXTREMELY |
| 8 | LIKE VERY MUCH |
| 7 | LIKE MODERATELY |
| 6 | LIKE SLIGHTLY |
| 5 | NEITHER LIKE NOR DISLIKE |
| 4 | DISLIKE SLIGHTLY |
| 3 | DISLIKE MODERATELY |
| 2 | DISLIKE VERY MUCH |
| 1 | DISLIKE EXTREMELY |

The question regarding familiarity was asked to panellists, and 5-point scale was used to evaluate familiarity of the energy drinks and the labels.

"How familiar are you with this product?" and "How familiar are you with this packaging?"

### 2.2.2 EsSense Profile® Method

EsSense Profile® consists of a CATA questionnaire with 39 different emotions for panellists to evaluate food products (developed by King & Meiselman,2010d). It provides extensive details on emotional responses to the product. The questionnaire used for the study consists of 21 emotions ("active", "adventurous", "bored", "daring", "disgusted", "eager", "energetic", "good", "happy", "interested", "joyful", "mild", "pleasant", "satisfied", "warm", "wild", "anger", "sadness", "surprised", "fear", and "contempt"). The emotion terms were selected after consensus by a focus group (N=4) within the Lincoln University, New Zealand after tasting the five different brands of energy drinks (Rockstar, Rockstar, Inc, USA ), (Red Bull, Red Bull GmbH, Austria), (Monster, Monster Beverage Corporation, USA), (Mother, Monster Beverage Corporation, Australia), and (V Guarana, Frucor, New Zealand) in a focus group. The emotional terms were selected on the basis of frequency of use (>20%) categorization and related to the food tested. Based on the previous study by Nestrud et al., (2016b) and suggestions by the EsSense Profile® developers, the researchers can select the emotion terms according to the requirement of the product.

### 2.2.3 Facial Expression

Facial expressions of 30 participants out of 47 participants were usable. This was due to the participants looking away from the camera or put their hand in front of their face. The facial

expression of panellists was evaluated using Affdex (Affectiva Inc., Waltham, USA) based on facial cues. Affectiva software detects and extracts the facial features (shown in Figure 2.3) and then classifies these facial action points. Facial Action Coding System (FACS) (Table 2.3) was used to encode the face images and emotional expressions. The scores for emotional expression vary from 0 (no expression) to 100 (expression present) (Magdin & Prikler, 2017b) and can be expressed in the line graph (Figure 2.4).

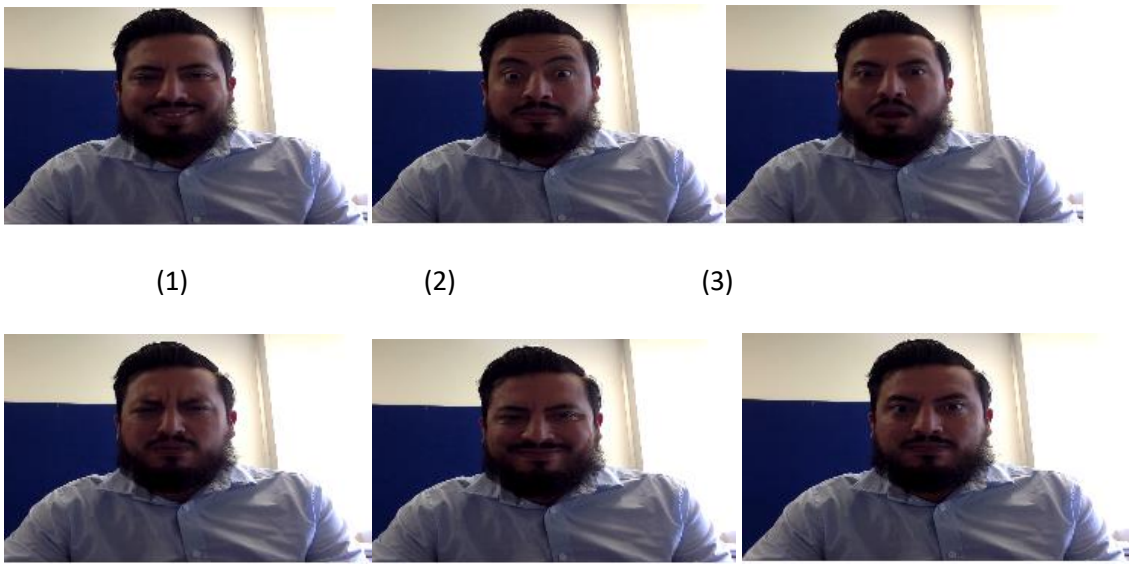



**Figure 2.3: Sample of images showing different emotions "happy", "surprised", "disgust", "smile" and "angry" by a participant.**

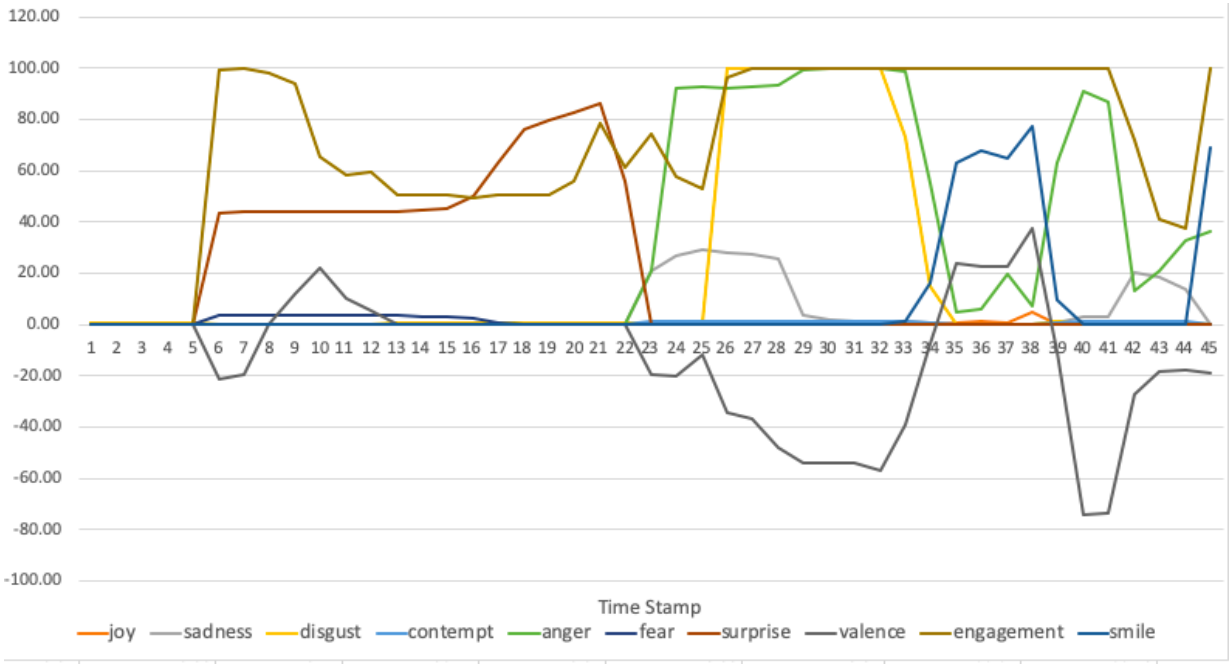


**Figure 2.4: A-Line graph showing the different intensity of emotions at different Time Stamp (seconds).**

**Table 2-3 Single Action Units (AU) In the Facial Action Coding System (Adopted from Ekman & Rosenberg, 2005)**

| AU NUMBER | DESCRIPTOR | MUSCULAR BASIS |
|---|---|---|
| 1 | Inner Brow Raiser | Frontalis, Pars Medialis |
| 2 | Outer Brow Raiser | Frontalis, Pars Lateralis |
| 4 | Brow Lower | Depressor Glabellae, Depressor Supercilli, corrugator |
| 5 | Upper Lid Raiser | Levator Palpebrae Superioris |
| 6 | Check Raiser | Orbicularis Oculi, Pars Orbitalis |
| 7 | Lid Tightener | Orbicularis Oculi, Pars Palebralis |
| 9 | Nose Wrinkler | Levator Labii Superioris, Alaeque Nasi |
| 10 | Upper Lip Raiser | Levator Labii Superioris, Caput Infraorbitalis |
| 11 | Nasolabial Fold Deepener | Zygomatic Minor |
| 12 | Lip Corner Puller | Zygomatic Major |
| 13 | Check Puffer | Caninus |
| 14 | Dimpler | Buccinator |
| 15 | Lip Corner Depressor | Triangularis |
| 16 | Lower Lip Depressor | Depressor Labii |
| 17 | Chin Raiser | Mentalis |
| 18 | Lip Puckerer | Incisivii Labii Superioris; Incisivii Labii Inferioris |
| 20 | Lip Stretcher | Risorius |
| 22 | Lip Funneler | Orbicularis Oris |
| 23 | Lip Tightener | Orbicularis Oris |
| 24 | Lip Pressor | Orbicularis Oris |
| 25 | Lips Part | Depressor Labii, or Relaxation of Mentalis or Orbicularis Oris |
| 26 | Jaw Drop | Masetter; Temporal and Internal Pterygoid Relaxed |
| 27 | Mouth Stretch | Pterygoids; Digastric |
| 28 | Lip Suck | |

## 2.3 Statistical Analysis

Hedonic scores of sensory attributes, liking and familiarity of the energy drinks during tasting session were analysed using Analysis of Variance (ANOVA). Tukey test was used as a *post hoc* data analysis technique to find the difference between the samples. The significance level was set at 5%. EsSense Profile® data was analyzed using XLSTAT software (XLSTAT Version 2019.4.2, Addinsoft, USA). The frequency counts of 21 emotion words which describe the sample and labels were calculated. Cochran Q test was used to find the difference between the samples by evaluating each emotion word used in the CATA questionnaire. The critical differences (shesken) was used for multiple pairwise comparison and Hellinger were used for *Post hoc test*. The values of purchase intent were

statistically analysed using the Cochran Q test using XLSTAT software. In addition, correspondence analysis (CA) was done on a total frequency count of 21 emotions for labels of both the samples to find the relationship between emotion terms and the labels of the product (Hair et al., 2006). For facial expressions, the data collected from Affectiva Affdex software for facial expressions were statistically analysed by Analysis of Variance (ANOVA) using Minitab® statistical software (Version 10.0.17763 Build 17763), Pennsylvania, USA.

# Chapter 3

# Results

## 3.1 Tasting Session Of Energy Drinks

### 3.1.1 Hedonic, Liking And Familiarity:

TABLE 3-1 shows the mean and standard deviations of the sensory attributes, liking scores, overall liking, and familiarity of the energy drinks. No significant ($p > 0.05$) differences were found between the energy drinks for all the sensory attributes (appearance, taste, aroma, sweetness, bitterness, mouthfeel and after taste). However, the panellists gave higher (but not significant) ratings to all the sensory attributes of Rockstar energy drink in comparison to V Guarana energy drinks.

**Table 3-1 Mean And Standard Deviation Values Of Sensory Attributes, Overall Liking And Familiarity Rating Of Rockstar And V Guarana Energy Drinks After Tasting.[1]**

| ATTRIBUTES | ROCKSTAR | V GUARANA |
|---|---|---|
| APPEARANCE | $6.96 \pm 1.33^{A}$ | $6.53 \pm 1.38^{A}$ |
| AROMA | $6.89 \pm 1.70^{A}$ | $6.40 \pm 1.51^{A}$ |
| TASTE/FLAVOUR | $6.72 \pm 1.75^{A}$ | $6.02 \pm 1.94^{A}$ |
| SWEETNESS | $6.55 \pm 1.82^{A}$ | $6.23 \pm 1.90^{A}$ |
| BITTERNESS | $5.75 \pm 1.93^{A}$ | $5.32 \pm 1.82^{A}$ |
| MOUTHFEEL | $6.75 \pm 1.91^{A}$ | $6.15 \pm 2.03^{A}$ |
| AFTER TASTE | $6.28 \pm 2.03^{A}$ | $5.51 \pm 2.17^{A}$ |
| OVERALL LIKING | $6.79 \pm 1.67^{A}$ | $5.98 \pm 2.03^{B}$ |
| FAMILIARITY | $2.723 \pm 1.30^{A}$ | $2.426 \pm 1.02^{A}$ |

[1] *The familiarity of different samples of energy drink was assessed using the 5-point categorical scale (1 = not at all familiar, 5 = extremely familiar) and sensory attributes and liking were measured by 9-point hedonic scale (1 = disliked extremely and 9 = liked extremely). Means with different superscripts in each row indicate significant differences ($p < 0.05$).*

There was a significant difference in the overall liking of the energy drinks. Rockstar had a significantly higher overall liking score compared to that of V guarana. The mean of overall liking for Rockstar was 6.79, whereas, the mean value for V Guarana was 5.98. Rockstar energy drink was liked more than V Guarana energy drink based on the sensory attributes. No significant difference in the familiarity of the energy drinks was found. However, Rockstar energy drink scored higher mean value on familiarity over V Guarana.

### 3.1.2 **Emotions And Purchase Intent**

The mean values of the self-reported emotions data are shown in TABLE 3-2.

**Table 3-2: Mean Values For Different Emotions Used After Tasting Session Of Rockstar And V Guarana Energy Drinks From Cochran Q Test[2]**

| ATTRIBUTES | ROCKSTAR | V GUARANA |
|---|---|---|
| ACTIVE | $0.49^{B}$ | $0.34^{A}$ |
| ADVENTUROUS | $0.19^{A}$ | $0.13^{A}$ |
| BORED | $0.11^{A}$ | $0.04^{A}$ |
| DARING | $0.06^{A}$ | $0.06^{A}$ |
| DISGUSTED | $0.06^{A}$ | $0.11^{A}$ |
| EAGER | $0.11^{A}$ | $0.13^{A}$ |
| ENERGETIC | $0.36^{A}$ | $0.43^{A}$ |
| GOOD | $0.49^{A}$ | $0.40^{A}$ |
| HAPPY | $0.28^{A}$ | $0.15^{A}$ |
| INTERESTED | $0.32^{B}$ | $0.13^{A}$ |
| JOYFUL | $0.30^{A}$ | $0.15^{A}$ |
| MILD | $0.26^{A}$ | $0.19^{A}$ |
| PLEASANT | $0.34^{A}$ | $0.28^{A}$ |
| SATISFIED | $0.26^{A}$ | $0.26^{A}$ |
| WARM | $0.15^{A}$ | $0.09^{A}$ |
| WILD | $0.09^{A}$ | $0.09^{A}$ |
| ANGER | $0.02^{A}$ | $0.02^{A}$ |
| SADNESS | $0^{A}$ | $0^{A}$ |
| SURPRISED | $0.11^{A}$ | $0.23^{A}$ |
| FEAR | $0.04^{A}$ | $0.02^{A}$ |
| CONTEMPT | $0.11^{A}$ | $0.09^{A}$ |

[2] *CATA questionnaire used to select emotions related to the sample and Cochran Q is used to find the difference between the products. Means with different superscripts in each row* indicate *significant differences (P < 0.05).*

For only the emotion terms "active" and "interested", the energy drinks were significantly different during the tasting session. The mean values of both the emotions were more during the tasting of Rockstar energy drinks than V guarana. The mean value of “active” was 0.49 for Rockstar and 0.34 for V guarana. The mean value of emotion term “interested” of V guarana was almost half (0.13) from the mean value (0.32) of Rockstar. There were no significant differences in the other reported emotion terms during the tasting of both the samples. The majority of the participants felt positive emotions “happy”, “adventurous”, “good”, “pleasant”, and “joyful” after tasting Rockstar energy drink . None of the panellists felt the emotion term “sadness” for either of the samples. More panellists used the emotion terms (not significant) “bored”, “contempt”, and “mild” with Rockstar energy drink than with V Guarana.

The frequency at which consumer’s intent to buy energy drinks based on the sensory attributes are presented in FIGURE 3.2. Participants (68.09%) expressed intent to buy Rockstar energy drink, while 55.32% of participants preferred V Guarana. There is no significant difference in the purchase intent of both the energy drinks.

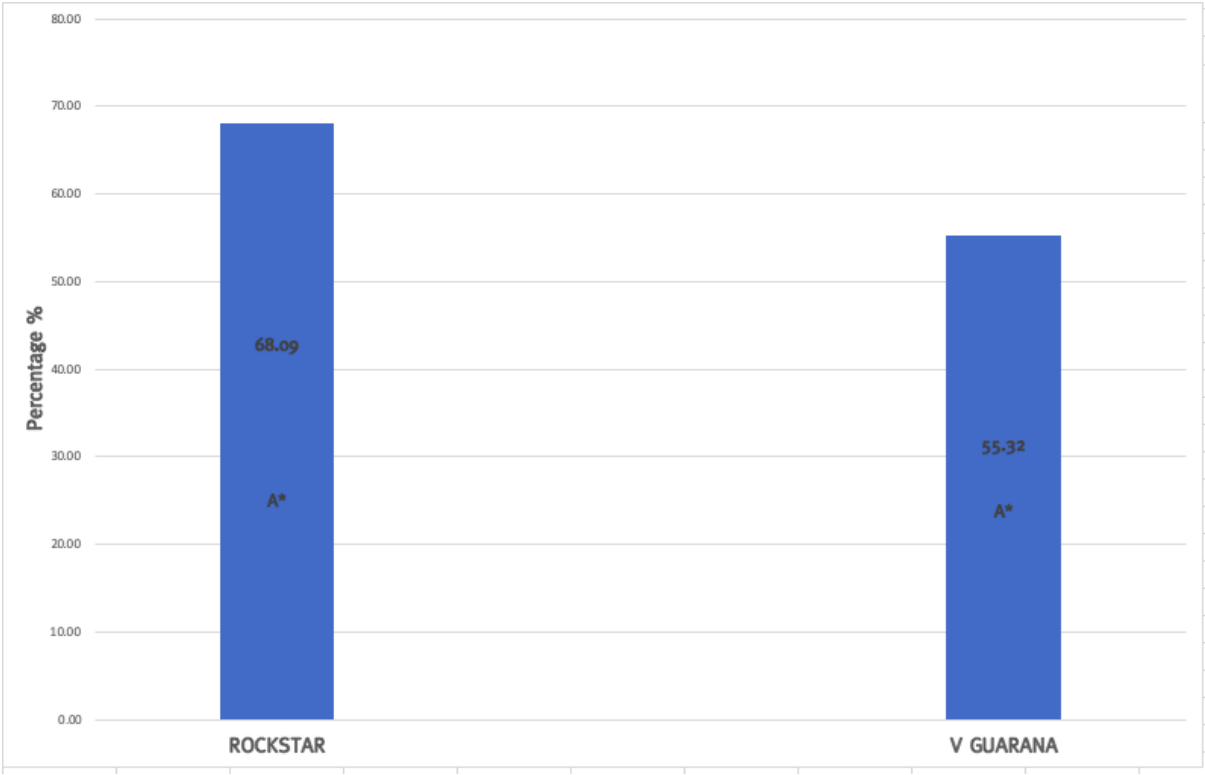



Figure 3.1: Purchase intent of the energy drinks using the Cochran Q test[3]

[3] *Cochran Q is used to find the difference between the products. The graph show percentage of consumers willing to buy energy drink after tasting session of the energy drinks. Alphabets with different superscripts in each row indicate significant differences (P < 0.05).*

### 3.1.3 **Facial Expressions**

The mean and standard deviations (TABLE 3-3 and 3-4) for the facial expression parameters (joy, sadness, disgust, contempt, anger, fear, surprise, valence, engagement, smile) shows that there were no significant differences between the different emotions felt during the tasting of Rockstar and V guarana energy drinks. Although no significant differences were found in facial expression parameters, there were some marginal differences in the means of some facial expression features. The reason for not being significant was the high variation of the results as it can be seen in the standard deviation. However, the mean values of "disgust", and "fear" were slightly higher (but not significant) during the tasting of V Guarana energy drink than the Rockstar energy drink. The Rockstar energy drink had higher mean values of a mouth open, jaw drop, and brow raise stimuli. The panellists felt slightly more engaged after tasting Rockstar energy drink than with V Guarana energy drink. For V guarana, participants felt slightly more "joy" and "smile" compared to that of Rockstar energy drink. The mean values of "joy" and "smile" were almost double in V Guarana than in Rockstar energy drink. The mean value of lip stretch (AU 20, Risorius) in V guarana was about fifty times higher compared to that of Rockstar. The mean value of eye closure was slightly (not significantly) higher in Rockstar energy drink than the mean value of eye closure in V guarana. Similarly, the brow raises mean value after tasting in Rockstar was slightly higher (but not significant) than that of V guarana energy drink.

**Table 3-3 The Mean and Standard Deviation Values for Facial Expression During the Tasting Sessions of Energy Drinks.**

| PARAMETERS | ROCKSTAR | V GUARANA |
|---|---|---|
| JOY | $0.56 \pm 2.55^{A}$ | $0.97 \pm 4.87^{A}$ |
| SADNESS | $0.02 \pm 0.01^{A}$ | $0.02 \pm 0.01^{A}$ |
| DISGUST | $0.36 \pm 0.22^{A}$ | $0.78 \pm 2.10^{A}$ |
| CONTEMPT | $2.36 \pm 10.07^{A}$ | $0.15 \pm 0.07^{A}$ |
| ANGER | $0.02 \pm 0.00^{A}$ | $0.02 \pm 0.00^{A}$ |
| FEAR | $0.00 \pm 0.00^{A}$ | $0.01 \pm 0.015^{A}$ |
| SURPRISE | $0.30 \pm 0.43^{A}$ | $0.17 \pm 0.08^{A}$ |
| VALENCE | $0.44 \pm 2.51^{A}$ | $0.52 \pm 4.63^{A}$ |
| ENGAGEMENT | $2.79 \pm 8.27^{A}$ | $1.25 \pm 5.11^{A}$ |
| SMILE | $0.83 \pm 3.07^{A}$ | $1.24 \pm 5.11^{A}$ |

**Table 3-4 The Mean and Standard Deviation Values for Facial Features During the Tasting Sessions of Energy Drinks.**

| PARAMETERS | ROCKSTAR | V GUARANA |
|---|---|---|
| INNER BROW RAISE | 0.72 ± 1.86$^{A}$ | 0.71 ± 2.76$^{A}$ |
| BROW RAISE | 2.03 ± 6.33$^{A}$ | 0.36 ± 0.85$^{A}$ |
| BROW FURROW | 0.09 ± 0.30$^{A}$ | 0.21 ± 0.79$^{A}$ |
| NOSE WRINKLE | 0.16 ± 0.41$^{A}$ | 2.24 ± 7.55$^{A}$ |
| UPPER LIP RAISE | 0.02 ± 0.07$^{A}$ | 0.31 ± 1.06$^{A}$ |
| LIP CORNER DEPRESSOR | 0.01 ± 0.02$^{A}$ | 0.01 ± 0.02$^{A}$ |
| CHIN RAISE | 0.27 ± 0.69$^{A}$ | 0.93 ± 3.79$^{A}$ |
| LIP PUCKER | 0.08 ± 0.17$^{A}$ | 0.09 ± 0.18$^{A}$ |
| LIP PRESS | 0.41 ± 1.20$^{A}$ | 0.08 ± 0.16$^{A}$ |
| LIP SUCK | 1.81 ± 5.44$^{A}$ | 1.91 ± 8.75$^{A}$ |
| MOUTH OPEN | 2.43 ± 10.18$^{A}$ | 0.58 ± 1.39$^{A}$ |
| SMIRK | 2.12 ± 9.00$^{A}$ | 0.13 ± 0.54$^{A}$ |
| EYE CLOSURE | 28.12 ± 41.23$^{A}$ | 18.96 ± 35.57$^{A}$ |
| ATTENTION | 67.90 ± 29.15$^{A}$ | 62.49 ± 30.10$^{A}$ |
| LIP TIGHTEN | 0.23 ± 0.47$^{A}$ | 0.31 ± 0.69$^{A}$ |
| JAW DROP | 0.40 ± 0.68$^{A}$ | 0.21 ± 0.25$^{A}$ |
| DIMPLER | 2.38 ± 7.72$^{A}$ | 0.15 ± 0.44$^{A}$ |
| EYE WIDEN | 0.02 ± 0.04$^{A}$ | 1.36 ± 5.35$^{A}$ |
| CHEEK RAISE | 0.04 ± 0.14$^{A}$ | 0.02 ± 0.04$^{A}$ |
| LIP STRETCH | 0.04 ± 0.14$^{A}$ | 1.11 ± 5.63$^{A}$ |

## 3.2 Labels Of Energy Drinks

### 3.2.1 Hedonic, Liking And Familiarity

The mean and standard deviation values of overall liking and familiarity of Rockstar and V guarana energy drinks labels are shown in TABLE 3-5. The Rockstar original label had a significantly higher ($P<0.05$) value of familiarity compared to its redesigned version. The overall liking of Rockstar original label was higher (not significant) than the redesigned label. Almost similar results for familiarity were found in case of original and redesigned labels of V guarana energy drinks. Panellists liked and were more familiar with the original label of V guarana energy drink than the redesigned label of the same energy drink, and the difference was significant. The mean values for the overall

liking of V Guarana original label were 6.77, and the mean value for the overall liking of V Guarana redesigned label was 5.83. In case of familiarity, the mean value of V Guarana original label was 3.45, and the mean value of V Guarana redesigned label was 2.64. There was a significant difference in liking and familiarity between the original labels of Rockstar and V Guarana energy drinks. The liking and familiarity score of V Guarana original label were 6.77 and 3.45, and the mean value of liking and familiarity of Rockstar original label was 5.89 and 2.47.

**Table 3-5 : Mean And Standard Deviation Values Of Overall Liking And Familiarity Rating Of Labels Of Rockstar And V Guarana Energy Drinks[4]**

| LABELS | VOL* | VDL** | ROL*** | RDL**** |
|---|---|---|---|---|
| FAMILIARITY***** | $3.45 \pm 1.41^{A}$ | $2.64 \pm 1.31^{B}$ | $2.47 \pm 1.43^{B}$ | $1.70 \pm 0.91^{C}$ |
| LIKING***** | $6.77 \pm 1.36^{A}$ | $5.83 \pm 1.82^{B}$ | $5.89 \pm 1.42^{B}$ | $5.23 \pm 1.76^{B}$ |

### 3.2.2 **Emotions And Purchase Intent**

The correspondence analysis in FIGURE 3.3 shows the relationship between different emotion terms used in the CATA questionnaire during the study and the original and redesigned labels of Rockstar and V guarana energy drinks. The principal component one (PC1 = 51.60%) and principal component 2 (PC2 = 32.71%) was stated for the labels of both energy drinks, thus showing data variability of 84.31%. Participants had associated “satisfied”, “interested”, “good”, “daring”, “energetic”, and “pleasant” emotion terms with V Guarana original label. The emotion terms “anger”, “contempt”, “adventurous”, “active”, “fear”, and “eager” was associated to the Rockstar Original labels (ROL). The redesigned labels (RDL) of Rockstar and V guarana labels were associated with negative emotions such as “disgusted”, “bored”, and “sadness”. A few numbers of panellists also linked “surprise”, and “mild” with the redesigned labels of Rockstar and V Guarana energy drinks. The principal coordinate analysis of the emotion terms with the liking is shown in FIGURE 3.4. It shows that the positive emotions like “happy”, “satisfied”, “joyful”, “pleasant”, “warm”, and “good” are associated with the liking of the labels of both the energy drinks, whereas, the negative emotions “anger” and “fear” are in separate coordinates and are not linked with the liking of the labels.

*4 *V GUARANA ORIGINAL LABEL (VOL); **V GUARANA REDESIGNED LABEL (VDL)*
**** ROCKSTAR ORIGINAL LABEL (ROL)*
***** ROCKSTAR REDESIGNED LABRL (RDL)*
****** FAMILIARITY OF DIFFERENT SAMPLES OF ENERGY DRINK WAS ASSESSED USING 5-POINT CATEGORICAL SCALE (1 = NOT AT ALL FAMILIAR, 5 = EXTREMELY FAMILIAR) AND LIKING WAS MEASURED BY 9-POINT HEDONIC SCALE (1 = DISLIKED EXTREMELY AND 9 = LIKED EXTREMELY). Means with different superscripts in each row indicate significant differences (P < 0.05).*

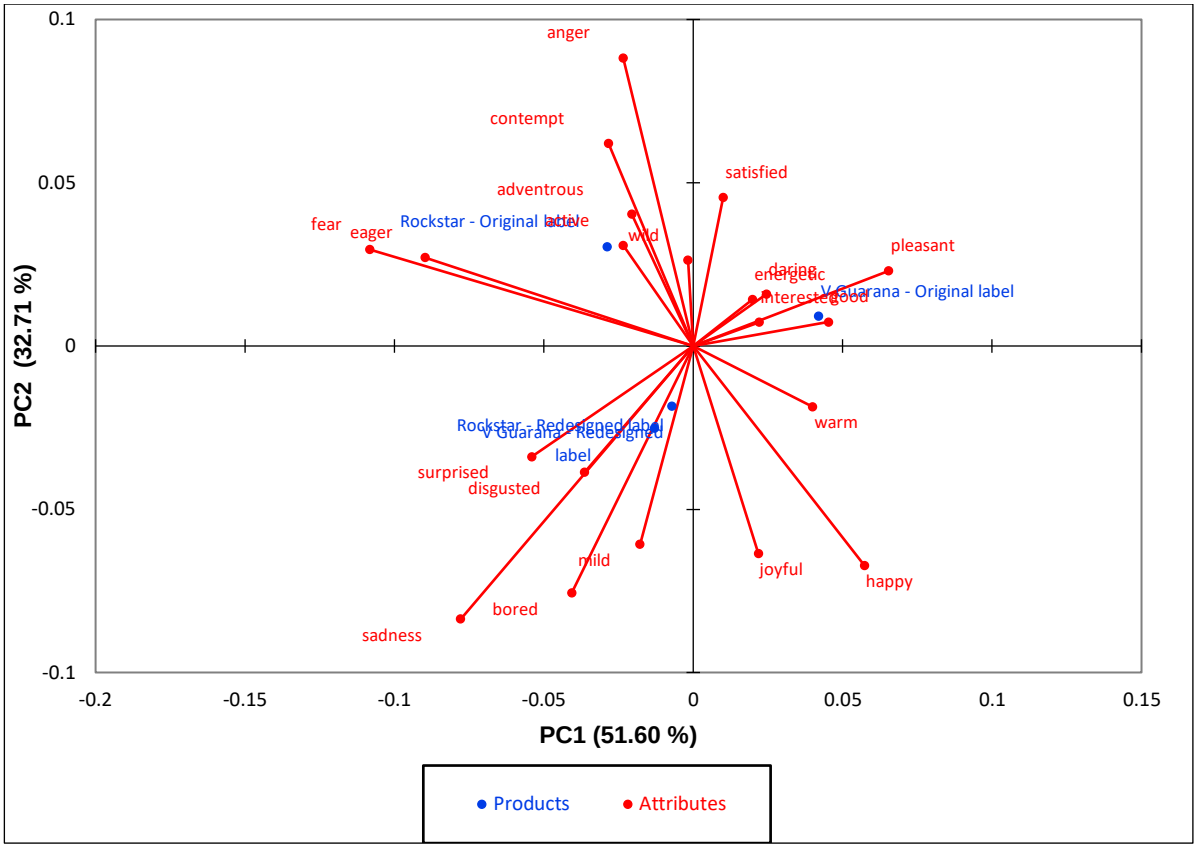



**Figure 3.2 : Correspondence analysis of the emotion terms for all the samples of labels.**

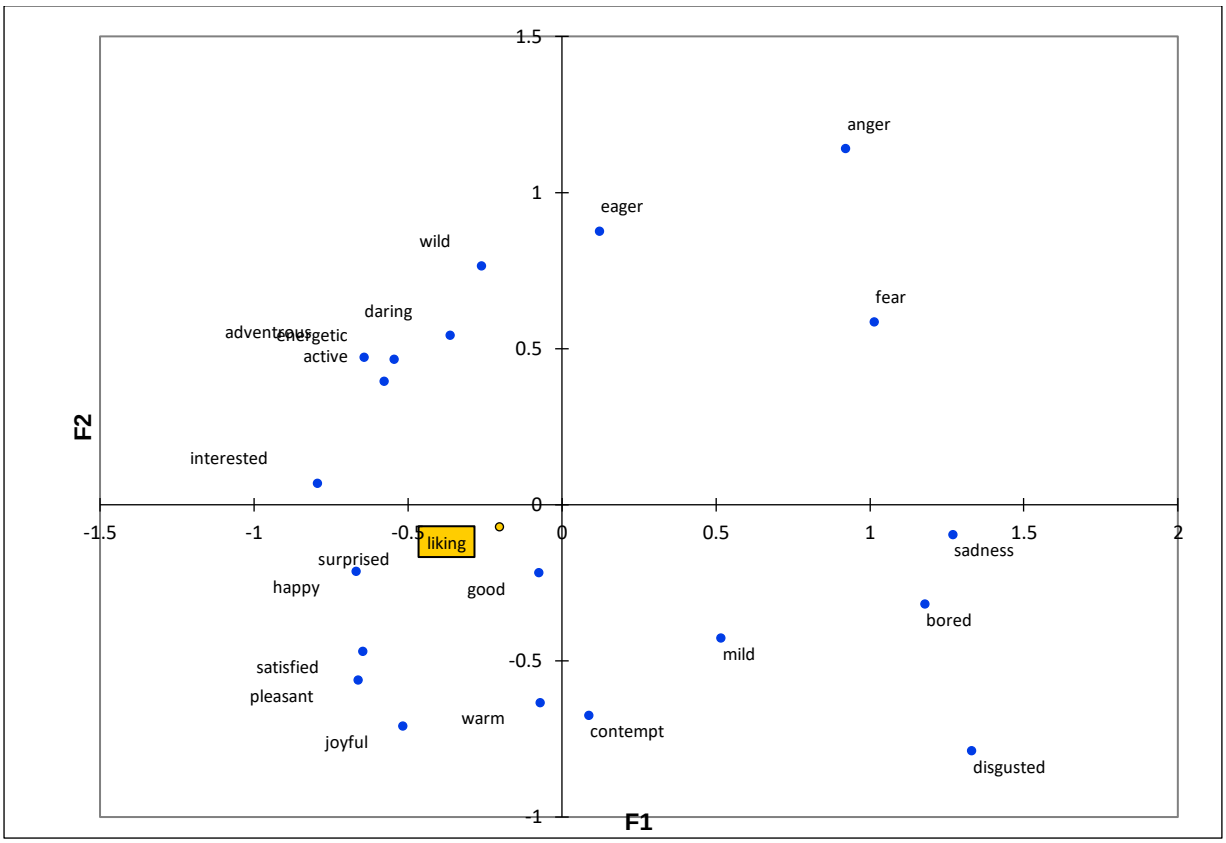



**Figure 3.3: Principal coordinate analysis of emotion terms with the liking scores for all the label samples of both the energy drinks.**

The mean values (TABLE 3-6) of different emotions selected for labels in the CATA questionnaire by the panellists. There were no significant differences in frequency values of the emotions “active”, “adventurous”, “bored”, “daring”, “disgusted”, “eager”, “good”, “energetic”, “interested”, “joyful”, “mild”, “satisfied”, “warm”, “wild”, “anger”, “sadness”, “surprised”, and “contempt” for original and redesigned labels of Rockstar and V guarana energy drinks. Rockstar original label (ROL) and V Guarana original label (VOL) was significantly different in mean values for emotion “happy”. The mean value of "happy" emotion term used for V Guarana original label was 0.34, while, the mean value of the same emotion used for Rockstar Original label was 0.11.

**Table 3-6: Mean Values For Different Emotions Used For Original And Redesigned Labels Of Rockstar And V Guarana Labels From Cochran Q Test[5]**

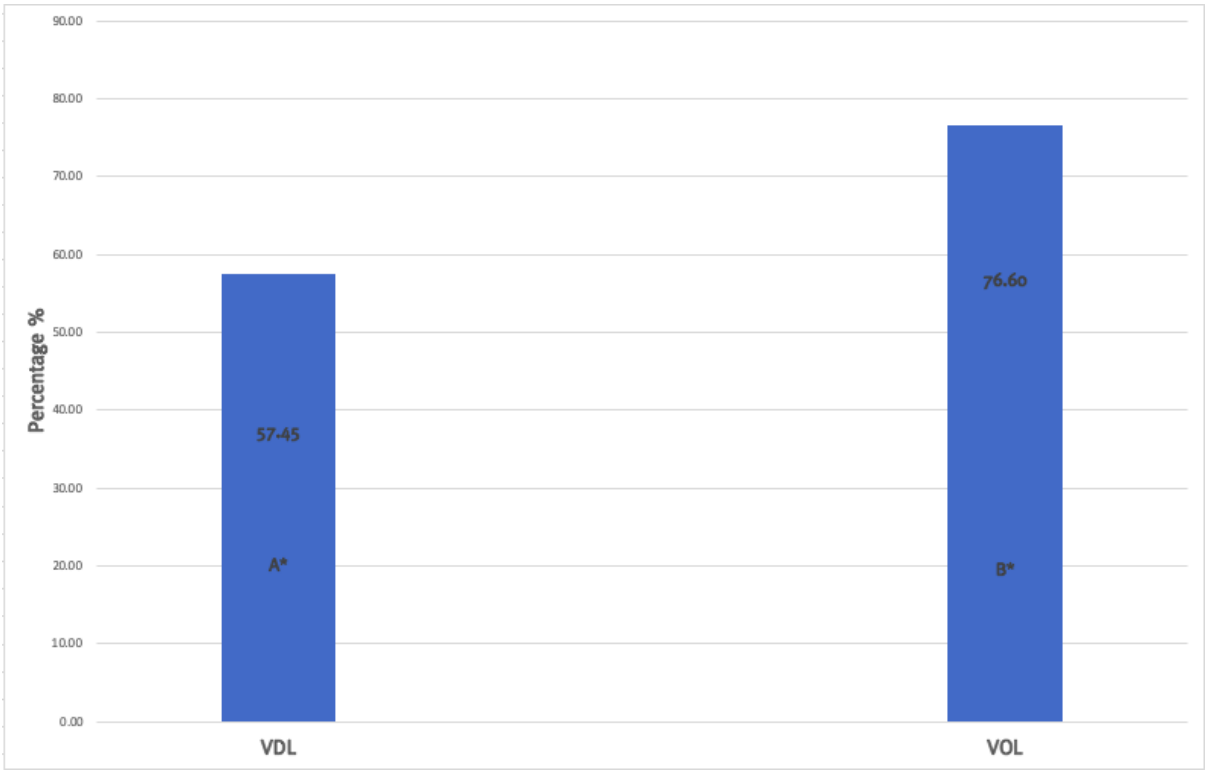
| ATTRIBUTES | ROCKSTAR - REDESIGNED LABEL | ROCKSTAR - ORIGINAL LABEL | V GUARANA - REDESIGNED LABEL | V GUARANA - ORIGINAL LABEL |
|---|---|---|---|---|
| ACTIVE | $0.30^{A}$ | $0.49^{A}$ | $0.40^{A}$ | $0.43^{A}$ |
| ADVENTUROUS | $0.21^{A}$ | $0.30^{A}$ | $0.17^{A}$ | $0.23^{A}$ |
| BORED | $0.23^{A}$ | $0.13^{A}$ | $0.21^{A}$ | $0.11^{A}$ |
| DARING | $0.15^{A}$ | $0.13^{A}$ | $0.09^{A}$ | $0.19^{A}$ |
| DISGUSTED | $0.06^{A}$ | $0.04^{A}$ | $0.06^{A}$ | $0.02^{A}$ |
| EAGER | $0.11^{A}$ | $0.17^{A}$ | $0.06^{A}$ | $0.02^{A}$ |
| ENERGETIC | $0.23^{A}$ | $0.32^{A}$ | $0.32^{A}$ | $0.43^{A}$ |
| GOOD | $0.26^{A}$ | $0.26^{A}$ | $0.26^{A}$ | $0.45^{A}$ |
| HAPPY | $0.17^{AB}$ | $0.11^{A}$ | $0.30^{AB}$ | $0.34^{B}$ |
| INTERESTED | $0.19^{A}$ | $0.26^{A}$ | $0.28^{A}$ | $0.36^{A}$ |
| JOYFUL | $0.23^{A}$ | $0.17^{A}$ | $0.34^{A}$ | $0.32^{A}$ |
| MILD | $0.15^{A}$ | $0.13^{A}$ | $0.26^{A}$ | $0.15^{A}$ |
| PLEASANT | $0.19^{AB}$ | $0.15^{AB}$ | $0.11^{A}$ | $0.34^{B}$ |
| SATISFIED | $0.11^{A}$ | $0.21^{A}$ | $0.15^{A}$ | $0.23^{A}$ |
| WARM | $0.04^{A}$ | $0.02^{A}$ | $0.04^{A}$ | $0.09^{A}$ |
| WILD | $0.15^{A}$ | $0.19^{A}$ | $0.13^{A}$ | $0.19^{A}$ |
| ANGER | $0^{A}$ | $0.11^{A}$ | $0.04^{A}$ | $0.04^{A}$ |
| SADNESS | $0.04^{A}$ | $0.02^{A}$ | $0.09^{A}$ | $0^{A}$ |
| SURPRISED | $0.11^{A}$ | $0.13^{A}$ | $0.17^{A}$ | $0.06^{A}$ |
| FEAR | $0.02^{AB}$ | $0.11^{B}$ | $0.04^{AB}$ | $0^{A}$ |
| CONTEMPT | $0.04^{A}$ | $0.11^{A}$ | $0.02^{A}$ | $0.04^{A}$ |

[5] *CATA questionnaire used to select emotions related to the labels of the sample and Cochran Q is used to find the difference between the products. Means with different superscripts in each row indicate significant differences (P < 0.05).*

In case of Rockstar original and redesigned labels, there was no significant difference in the mean values for emotion term “pleasant”, whereas, the mean value for emotion term “pleasant” is two times higher in V Guarana original label as compared to the mean value for “pleasant” of V Guarana redesigned label. The mean value for emotion term “fear” was significantly higher in case of Rockstar original label than for the V guarana original label.

According to the frequency radar graph (FIGURE 0.2), only 14 participants felt emotion "active" after evaluating the Rockstar redesigned label while 23 participants felt the same emotion in a case of Rockstar original label. In the case of V Guarana original and redesigned labels, almost the same number of participants felt the “active” emotion. In Rockstar redesigned label, 11 participants marked it as bored, whereas, only 6 participants felt the same emotion for Rockstar original label. The highest number of participants felt “good”, “energetic”, “happy”, “interested”, and “pleasant” emotions for V Guarana original label as compared to other labels. The negative emotions “sadness”, “disgusted”, and “fear” was marked least number of times for V Guarana original label. The frequency of use of positive emotions was more in original labels of Rockstar and V Guarana than the redesigned labels of both the energy drinks.

FIGURE 3.5 shows the percentage of participants intent to buy Rockstar energy drink and V Guarana based on the labels. There is a significant difference in purchase intent for V guarana original and redesigned labels. The participants preferred the original label as compared to the redesigned label. There was no significant difference ($p>0.05$) between the purchase intent of Rockstar energy drink based on the labels. 55.32% of panellists intent to purchase energy Rockstar original label energy drinks in the future, while 44.68% of panellists preferred redesigned label. Figure 3.6 shows the significant difference between the purchase intent of Rockstar and V guarana based on their original label. 76.6% of panellists liked to buy V Guarana original label, whereas only 55.32% of panellists preferred to buy Rockstar based on the extrinsic property of the product.



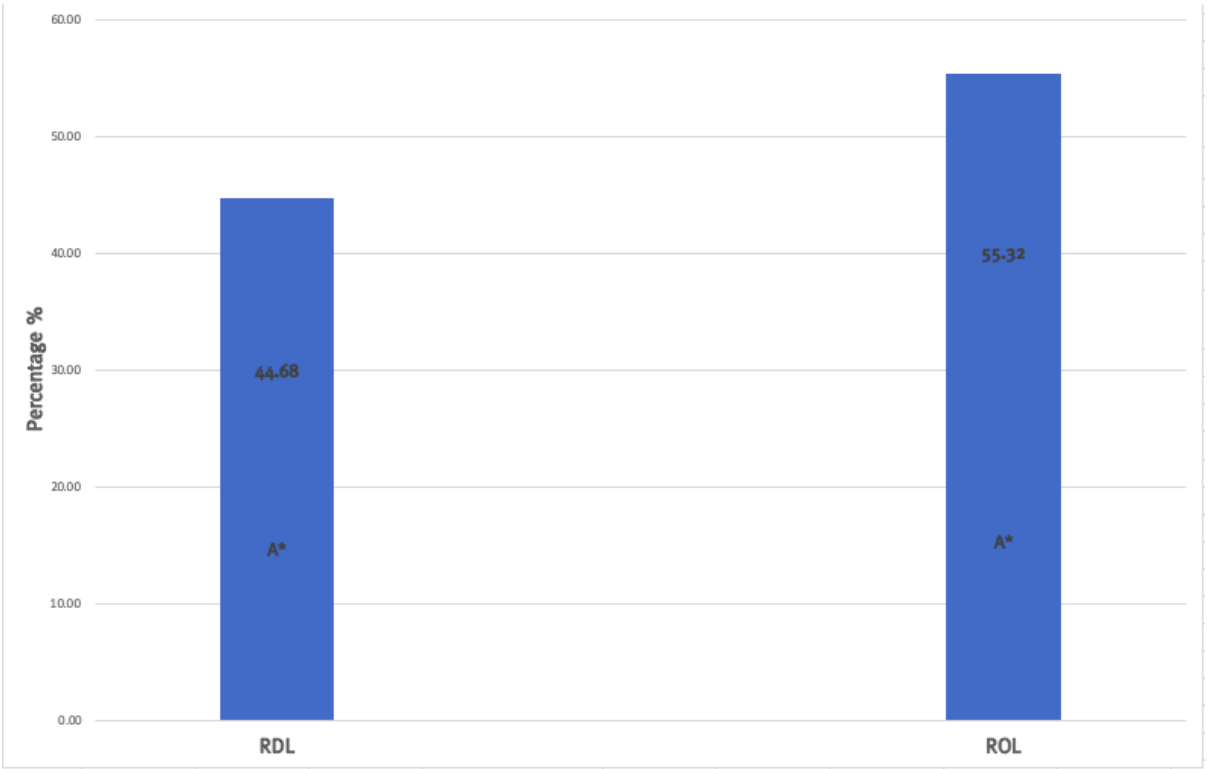




**Figure 3.4 : Purchase intent based on the labels of energy drinks using the Cochran Q test[6]**

[6] *V Guarana Original Label (VOL), V Guarana Redesigned Label (VDL), Rockstar Original Label (ROL), And Rockstar Redesigned Label (RDL). Cochran Q is used to find the difference between the products. The graph show percentage of consumers willing to buy energy drink based on labels of the energy drinks. Alphabets with different superscripts in each row indicate significant differences (P < 0.05).*

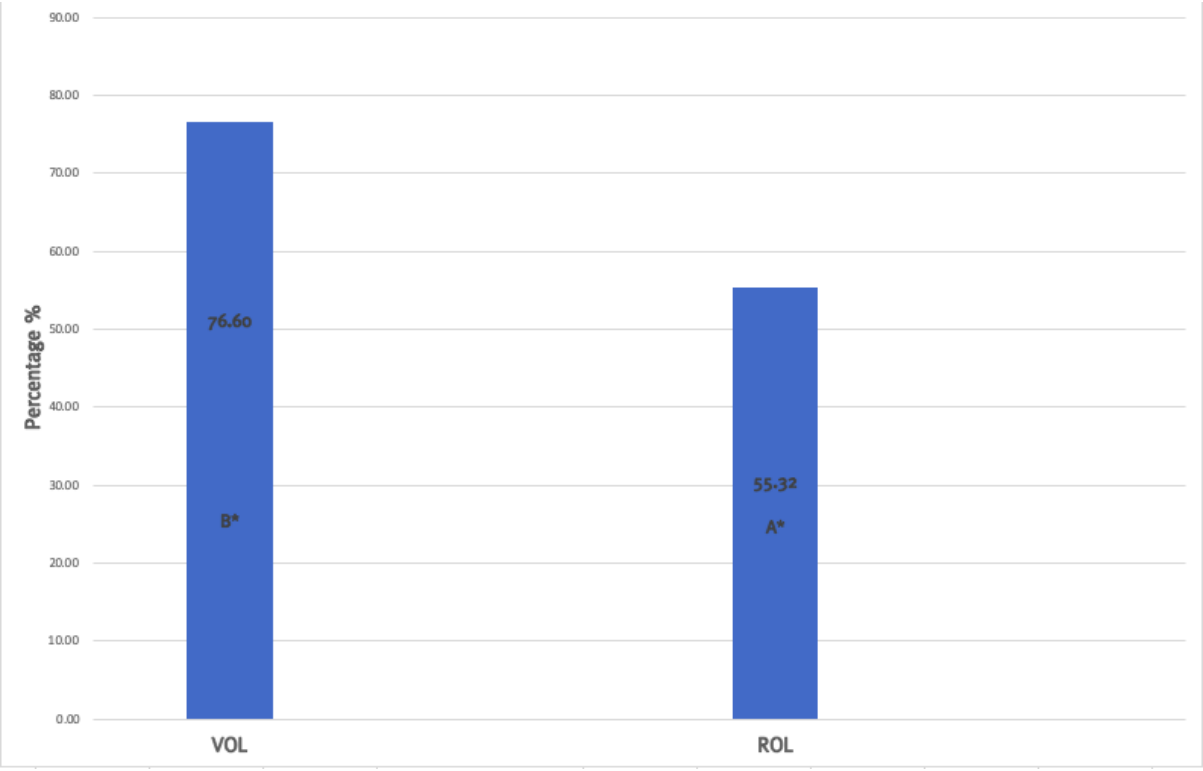



**Figure 3.5 : Purchase Intent of Rockstar And V Guarana Original Labels Using Cochran Q Test[7]**

[7] *V Guarana Original Label (VOL) And Rockstar Original Label (ROL)*
*Cochran Q is used to find the difference between the products. The graph show percentage of consumers willing to buy energy drink based on labels of the energy drinks. Alphabets with different superscripts in each row indicate significant differences (P < 0.05).*

# Chapter 4

# Discussion

## 4.1 Tasting Session Of Energy Drinks

In the present study, results from the tasting sessions show that the participants differ in overall liking scores of the energy drinks. Most of the participants liked Rockstar energy drink more than the V Guarana energy drink. The mean value of familiarity (not significant) of Rockstar was higher than V Guarana. Previous studies show that the overall liking of the product is closely related to its familiarity for both sensory and physiological responses (Torrico et al., 2019). According to Pliner & Pelchat (1991a), the liking of the food product and the level of familiarity had a linear relationship. Consumers feel comfortable and content with the acquainted brands with which they are satisfied rather than exploring a new one. Familiarity also affects the liking of the sensory attributes (taste, aroma, texture, appearance, sweetness and bitterness), as in the present study, energy drink Rockstar had scored higher mean values for all the sensory attributes as compared to V Guarana energy drink. Previous studies by Pliner and Pelchat (1991b) also supports the fact that familiarity affects the liking of sensory attributes of the products.

In the EsSense Profile® questionnaire, the total frequency count for the use of emotion terms ranges from 0-23 during the tasting session and for labels (FIGURE 0.1and 0.2). The positive emotions such as “happy”, “joyful”, “pleasant” had higher frequency counts for both the energy drinks than the negative emotions such as “sad” and “angry”. These results were in line with earlier findings that consumers use more positive emotions to describe the food products than negative emotions (Desmet & Schifferstein, 2008b; and Gibson, 2006c). The brand (Rockstar energy drink) that enjoyed higher liking also received more scores in high arousal words parameters such as "adventurous", and "active". It shows that high arousal words such as "adventurous", and “active” are as important as positive emotions and are critical parameters for brand choice in the energy drink category. Caffeine is one of the main ingredients of the energy drink, can cause high arousal emotions such as “active”, and “adventurous” in the consumers (Thayer, 1989; and Smith & Rogers, 2000a). A mild dose of 1-4 mg/Kg of caffeine produces stimulant effects such as improved attention and alertness (Scholey & Kennedy, 2004). The caffeine content in Rockstar and V guarana is 160 mg and 146.6 mg per 16 fl.oz, respectively. Sweetness is also a trigger for happiness. The high sugar content in the energy drinks also helps in boosting the mood along with the caffeine, as both combined increases the blood pressure immediately (Smith et al., 2003). According to Macht & Dettmer (2006); and Macht &

Muller (2007), the immediate effect of high sugar food products and carbohydrates is an escalation of mood and reduction of negative thoughts. Specterman et al., (2005) studied that the combined effect of caffeine and glucose had increased excitability and impulsiveness in the participants after the consumption of Lucozade soft drink, as blood glucose level increased and almost doubled within half an hour of consumption.

The study also illustrates the relationship between the food evoked emotions and liking of the energy drinks and how it affects the purchase decisions of the consumers. In the present study, there was no significant difference in purchase intent based on sensory attributes of the energy drinks. Although, the majority of panellists (68%) preferred buying Rockstar energy drink rather than V Guarana (55%). The positive emotions such as “active”, “good”, “adventurous”, “pleasant”, “joyful”, “contempt”, “warm”, “interested”, and “happy” had higher mean values in Rockstar energy drinks than in V Guarana during the tasting session. This shows that emotions and overall liking of the product strongly influence the purchase decisions taken by the consumers. Emotions play an essential part in our lives. Koster and Mojet (2008) stated that to make a product successful in the market, innovators have to look beyond the liking scores of the product. Consumers often engage better with familiar brands than unfamiliar brands. Brand loyalty is also enhanced by the level of engagement of the consumer with the brand, helping the brand be integrated gradually into the consumer's habitual purchase patterns (Yuwono, 2016). The observed mean values of familiarity show that the more familiar brand elicited a higher level of engagement from the consumer.

The emotional responses are often unconsciously triggered, so the study also endeavoured to interpret the facial reactions of panellists to the two brands of energy drinks. The high variability of standard deviation in facial expression scores was due to less number of panellists were evaluated for it. The other reason can be that the software was not able to recognise some of the facial movements. Triyanti, Yassierli & Iridiastadi (2019) studies that the software did not recognise some of the facial expressions like “sad” and "anger" because of limited facial movements during the tasting. Hence, further studies with more number of participants from different cultures and ethnicity would help in the reduction of the data dispersion and better understanding of the relation of unconscious responses with the acceptability of the product. The mean values of micro-expression for sadness; Inner brow raise (AU 1) was almost same after tasting Rockstar and V Guarana energy drink, which correlates with the same mean value of 0.02 for sadness for both the energy drinks. During the tasting of V Guarana energy drink, the mean values of raised upper lip (AU 10, Levator Labii Superioris, and Caput Infra orbitalis) and nose wrinkle (AU 9, Levator Labii Superioris, and Alaeque Nasi) were higher than that of Rockstar, which explains the higher value of

disgust facial expressions in the former case. Steiner et al., (2001b) studied the change of facial expression to disgust in infants after tasting bitter compound by squinching the eyes and wrinkling of the nose.

In the present study, EsSense Profile® results show that panellists felt more "active", "adventurous", and “good” after tasting the Rockstar energy drink and overall liking ratings were also more for the same energy drink than the V Guarana energy drink. However, in the case of Facial expressions, the mean values for positive emotions such as “joy”, and “smile” were more for V Guarana energy drink than the Rockstar. This shows that unconscious responses, overall liking and EsSense Profile® vary in the outcome. This finding was in accordance with the study, which stated that overall liking, self-reported questionnaire and unconscious responses of the consumers are weakly to moderately correlated (Danner et al., 2014b).

## 4.2 Labels Of Energy Drinks

The present study shows that along with intrinsic factors, even extrinsic factors such as packaging and labels affect the food choices of the consumers and also provide additional information about the product (Thomson, 2008; Liao et al., 2015). The study also looked to understand if the change of colour of the energy drinks packaging affected the emotional response to the brand. The results showed that the original labels of the energy drinks had higher scores of liking and familiarity as compared to redesigned labels. This shows that original labels of both the energy drinks were familiar and have higher recall values than the redesigned labels of the energy drinks. This result is in line with Gunaratne et al., (2019), who proved that familiar packaging concepts had a positive correlation between liking and familiarity. The panellists felt more positive emotion terms “active”, “energetic”, “good”, “pleasant” and “happy” with V Guarana original label than the redesigned label. Thus the consumers react to positive stimuli and have an emotional connection with the familiar products (Merlo et al., 2019b). According to the Correspondence Analysis of the present study, the emotion terms “fear" and "anger" were linked to the Rockstar original label; on the other hand, only positive emotion terms such as “interested”, “energetic”, “pleasant” and “satisfied" were linked with V Guarana original label.

Furthermore, there was a significant difference in purchase intent of Rockstar and V Guarana based on the basis of the original label (FIGURE 0.4). Based on the Original labels, the frequency count of 76.6% of panellist showed interest in buying V Guarana energy drink, while, only 55.3% wanted to buy Rockstar energy drink. This result shows that positive emotions had a more substantial effect on purchase behaviour than that of negative emotions. These findings are in line with the conclusions

made by Lewis et al., (2014) that positive and negative emotions affected the purchase intent, but positive emotions had a slightly higher effect than the negative emotions based on the packaging of the product. In the present study, the overall liking scores of Rockstar energy drink was more than V Guarana during the tasting session, whereas, the overall liking of the energy drink based on packaging (label and colour) was higher for V Guarana energy drink than the Rockstar. Similar results were found by Delgado, Gomez-Rico, & Guinard (2013) in case of olive oil, where overall liking and acceptability of olive oil brands varied during the tasting session and on the basis of packaging. In the present study, the Principle Coordinate Analysis graph shows that the emotions linked closer to the labels provides little information about the labels, whereas, the emotions weakly associated with labels were relevant and provided more information about the product and helps in better understanding of consumers preferences based on labels. Besides positive and negative emotions, the colour of the packaging also triggers the degree of emotional arousal in the consumers. The colour of the packaging used in food and beverage brands depicts the type/flavour of the product found within (Gimba, 1998) and helps consumers to connect with the product lying along with 1000 other products in the supermarket. The study shows that there is a threshold where consumers can recognize the labels as different from the original. Thus, future studies are recommended to study the effect of change in the design or colour of the packaging below the limits of Just Noticeable Difference (JND) on consumer acceptance.

**Limitations**: The panellists were served the energy drinks from paper cups and not directly from the cans, thereby not creating an immediate connection between the consumed drink and the packaging. The panellists evaluated the labels of the energy drinks from the screen. This changes could result in panellists reacting to the packaging based on the perception of the design of the labels and not as a holistic product with packaging. The substantial insight into the effect of emotions on food product and packaging were obtained from the experiment conducted in the controlled environment of sensory booths. The future study recommended checking if there is a change in emotions and liking if the same study is done in holistic natural settings like in sports avenue or bar.

# Chapter 5

# Conclusion

The data from the above study shows the importance of cognitive, emotional measures and unconscious responses to assess and differentiate the energy drinks during the tasting session as well as during visual inspection of the labels of the products. The results show that multiple variables can differentiate the product more precisely. During the tasting session, the overall liking scores of Rockstar energy drink are more than V Guarana, as sensory attributes, influence the overall acceptability of the product. The magnitude of positive emotions used for both the energy drinks was more than the negative emotions. The positive emotions such as "happy", "interested", "good", and "pleasant" got higher scores during the tasting session of Rockstar than the V Guarana energy drinks. The high arousal words such as "active" and "adventurous" were used more in case of Rockstar than the V Guarana. Thus, the overall liking of Rockstar energy drink was related to the positive emotions given to the same energy drink by the panellists.

In the case of Facial expressions, the unconscious responses show that panellists felt more "joy", and "smile" after tasting V Guarana as compared to Rockstar energy drink. Thus, it showed that the emotional and physiological responses were weakly or moderately related to the unconscious responses. The unconscious responses are related to consumer behaviour, while, the use of questionnaires require more use of cognitive and rational reasoning, might be the reason for the difference in the findings and need further studies to understand the reason. Familiarity plays an essential role in deciding the purchase pattern of consumers. Familiarity and Purchase intent (tasting and visual inspection of labels) are interrelated; consumers felt comfortable buying a familiar product rather than experimenting on a new product. The overall appearance of the product packaging plays a crucial role in designing consumer’s expectations. There was an incongruity between the overall liking of the energy drink based on a tasting session and the visual inspection of the packaging (brand, label, and colour). The companies attract consumers with the attractive packaging of the product. However, the sensory attributes of the product might not meet the consumer’s expectations. Hence, the consumer should have complete knowledge of the product before purchasing it.

The effect of natural settings on the emotional responses to energy drinks is still to be studied. However, the current study had shown that the elicited scenario in central location tests gave

emotional responses a step closer to the consumer feelings for the energy drinks. Therefore, it is recommended to take account of the scenario while measuring emotions for the specific product.

# Appendix A

## A.1 Tasting Session Of Energy Drinks ( Radar Graph )

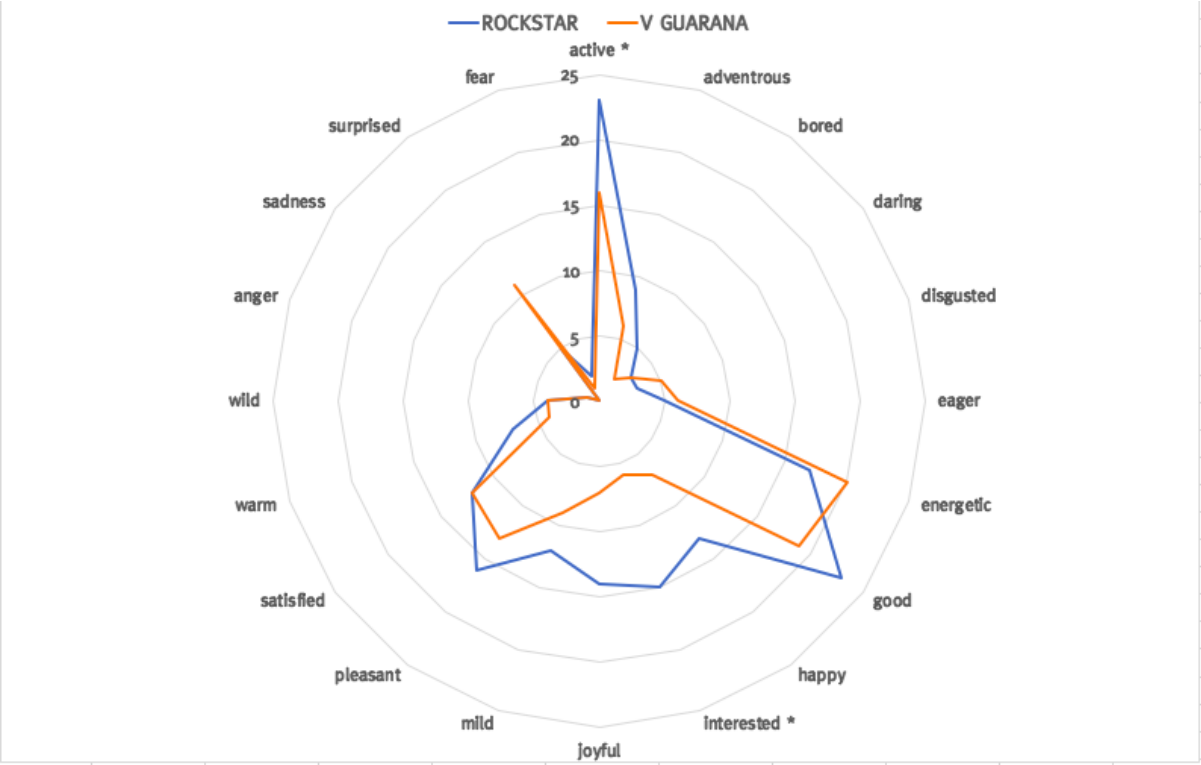



**Figure 5.1Radar Graph Showing the Frequency of Emotions Used After Tasting of Rockstar And V Guarana**[8]

[8] *Emotions with different superscripts indicate significant differences (P < 0.05).*

## A.2 Labels Of Energy Drinks ( Radar Graph )

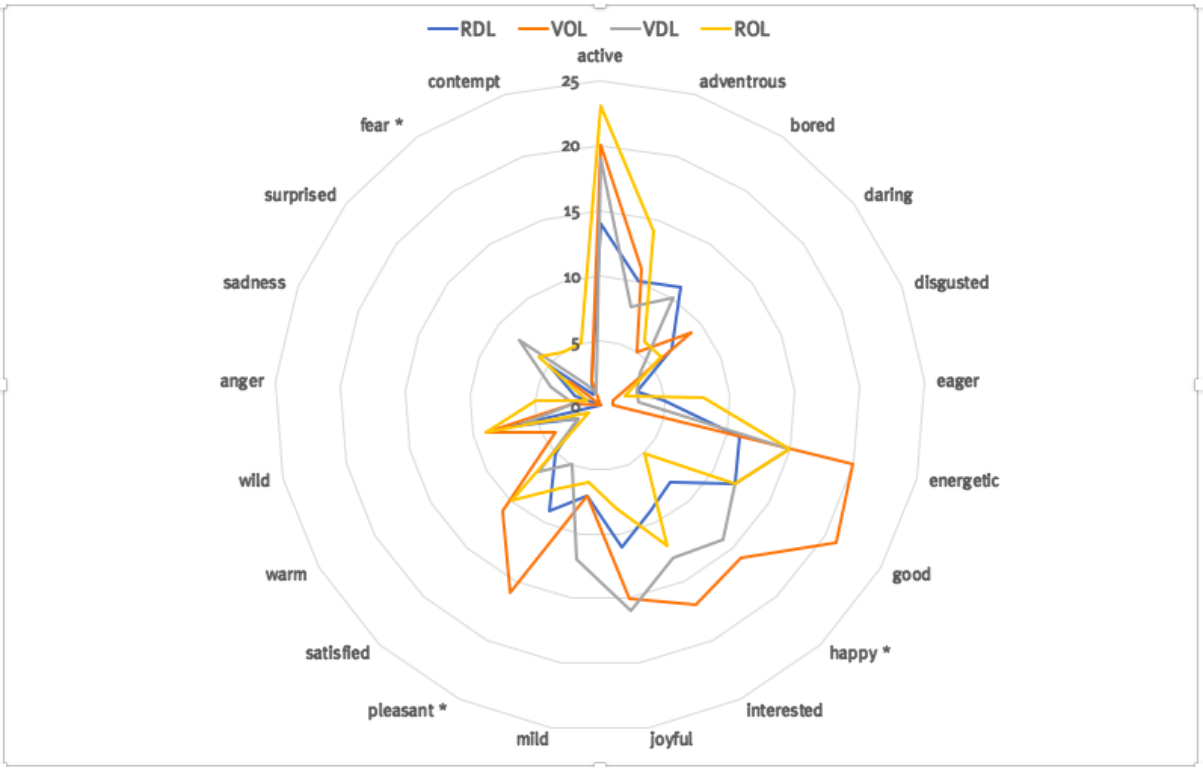



**Figure 5.2 Radar Graph Showing the Frequency Of Emotions Used For V Guarana and Rockstar energy drink Original and Redesigned Labels**[9]

[9] *V Guarana Original Label (VOL), V Guarana Redesigned Label (VDL), Rockstar Original Label (ROL), and Rockstar Redesigned Label (RDL). Emotions with different superscripts indicate significant differences (P < 0.05).*

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